Candle Filter Element

The invention relates to a candle filter element for installation in a pressurized container, comprised of a removably disposed central tube that has a closed surface and has support bodies disposed around it, over which a filter cloth is stretched.

A candle filter element of this type has been disclosed by EP-A-0 066 921. The known filter element has support bodies in the form of a tube bundle. However, the use of tube bundles creates problems with regard to cleaning, especially before a change of product. Product residues in the interstices between individual tubes can only be partially removed or cannot be removed at all. This applies particularly to filtration of foods, pharmaceutical products, and biotechnology products where CIP cleaning (cleaning in place) or SIP (sterilization in place) is required.

DE-B-11 41 980 has disclosed a filter element comprised of a perforated central drainage tube. The central drainage tube is open at both ends and is not suited for draining filtrate from a pressurized container. Rigid support bodies are fastened in a star-shaped formation around the central tube. The star-shaped support body comprises a unit together with the central tube. The central tube cannot be removed for the internal cleaning. This is essential for the food, pharmaceutical, and biotech industries were CIP cleaning (cleaning in place with cleaning fluids) and SIP

(sterilization in place with steam or chemical products) is required by the FDA (Food and Drug Administration) in order to assure the separation of the individual products.

Since the filter cloth is intended to rest against the outermost points of the support bodies, an increased wear on the filter cloth occurs at these points.

CH-A-631 352 has disclosed a filter element with a closed central tube. The filter cloth rests against the rods which are separated from the central tube by lateral struts. The known filter element has the disadvantage that during filtration, the filter cloth presses against the central tube over a large area, which considerably reduces the effective filtration surface area. Here too, increased wear on the filter cloth occurs at the contact points as a result of very high tensile stresses. The construction with longitudinal rods and lateral rods which produce the connection to the central tube causes filter elements of this type to require numerous process steps.

The object of the invention is to produce a filter element that is of a simple and stable construction, assures an efficient removal of solids, and yet assures a thorough cleaning.

This object is attained according to the invention by virtue of the fact that the support body is embodied as a six-lobed sheath element, the surface of the sheath element has openings, and the curvatures of the sheath element are semicircular. The support body here is comprised of an outer

sheath which is disposed around a removable central tube. This has the advantage that difficult-to-clean contact points between the individual support elements are eliminated. At the same time, the savings in material and therefore weight can be achieved, and the surface area to be cleaned can be reduced.

It is useful to embody the sheath element with at least two, and preferably at least three lobes. With fewer than three curves in the sheath, the cleaning action is insufficient.

It is useful to connect the sheath element to the central tube. The central tube can then be removed together with the support body. This has the advantage that the candle filter element can be made pressure-tight. The removal of the central tube has the additional advantage that the interstices can be exposed for cleaning.

It has turned out to be particularly advantageous to embody the curves of the sheath element as semicircles. The curved support body has the advantage that there are no corners and edges to damage the e.g. textile filter medium during filtration. The round embodiment of the support body consequently extends the service life of the filter medium.

In one embodiment, the surface of the sheath element is provided with openings. These drainage openings can be round, angular, square, polygonal, rectangular, or slit-shaped.

Slit-shaped openings have proven to be particularly advantageous. The slit-shaped openings extend at an angle α

of less than 120°, in particular between 60° and 120°, in relation to the axis of the sheath element. An angle of less than 60° has the disadvantage that the strength of the sheath is no longer assured; the same is true for an angle of greater than 180°. The most suitable material has turned out to be stainless steel as is used in the food and pharmaceutical industries.

The invention will be described in detail below in conjunction with the drawings.

Fig. 1 is a schematic longitudinal section through the candle filter element according to the invention,

Fig. 2 is a schematic cross section through the candle filter element, and

Fig. 3 schematically depicts a variant of the six-lobed sheath element of the candle filter element, connected to the central tube.

In Fig. 1, a bottom of the candle filter element is labeled with the reference numeral 1. A sheath element 4 is disposed between the bottom 1 and a head part 2. The central tube 3 has a closed surface over its entire length. A filter medium 5, preferably of woven cloth, is disposed over the sheath element 4. A coupling 6 for fixing the candle filter element inside a container, not shown, is provided in the head part 2. The sheath element 4 is partly provided with openings 7, which are shown on the right side of Fig. 1 in the form of circular holes, for example, and are shown on the left side of Fig. 1 in the form of slit-shaped openings which form an angle α with the axis of the sheath element.

During operation, the candle filter element is disposed in the container, not shown. The filtration takes place through the filter medium 5 from the outside inward, through the openings 7 of the sheath element 4, with the clarified filtrate collecting between the sheath element 4 and the central tube 3. The filtrate comes into the bottom part of the central tube 3 and leaves the central tube 3 through its upper opening, traveling into the filtrate chamber, not shown, of the filter container. The drainage of the filtrate is considerably improved by the openings 7 in the sheath element 4.

Fig. 2 shows a six-lobed sheath element 4 mounted on the central tube 3, with the filter medium 5 in the filtration state (solid line) and with the filtration medium 5 in the inflated state (dotted line) during cleaning. The filter medium 5 is stretched over the sheath element 4 so that forms a wavy surface during filtration from the outside inward and as a round cross section during backwashing.

In Fig. 3, the sheath element is comprised of six individual sheath parts 4', 4", etc. The individual sheath parts 4', 4", etc. are attached to the central tube 3 at the points 8.

The sheath element 4 according to the invention, which is disposed in a candle filter, has the advantage that a filter medium can be supported in a simple manner and the filtrate can drain unhindered into the space between the central tube 3 and the filter medium 5.